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[Handwritten signatures and initials]

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF:

Hideharu SATO

SERIAL NO. 09/155,635

GROUP ART UNIT: 1745

EXAMINER: Carol Chaney

FOR: LITHIUM ION SECONDARY BATTERY

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DECLARATION UNDER 37 C.F.R. 1.132

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SIR:

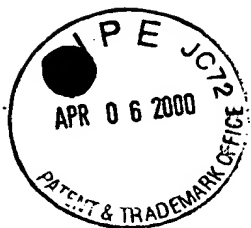
Now comes Hideharu SATO, a citizen of Japan, and a resident of c/o Mitsubishi Chemical Corporation, Tsukuba Research Center, 3-1, Chuo 8-chome, Amicho, Inashiki-gun, Ibaraki-ken, Japan, who declares and says that:

1. received a doctor's degree in engineering from Tokyo Institute of Technology in March, 1995.

2. I have been employed by Mitsubishi Chemical Corporation since April 1995; and was engaged in the study of negative electrode for lithium ion secondary battery.

3. I am one of the inventors of U.S. Patent Application, Serial No. 09/155,635.

4. I have read the Office Action dated October 18, 1999, have understood the Examiner's rejection of the invention



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claimed in the above application. Then, the following experiments for LONZA KS 6, 15, 25, 44 and 75 graphites were conducted.

(1) Measurement of particle size of LONZA KS 6, 15, 25, 44 and 75:

Particle size determination was made by using a laser diffraction type particle size analyzer. The automatically calculated average particle size was used as standard of evaluation.

(2) Measurement of specific surface area of LONZA KS 6, 15, 25, 44 and 75:

The specific surface area was measured according to the BET one-point method.

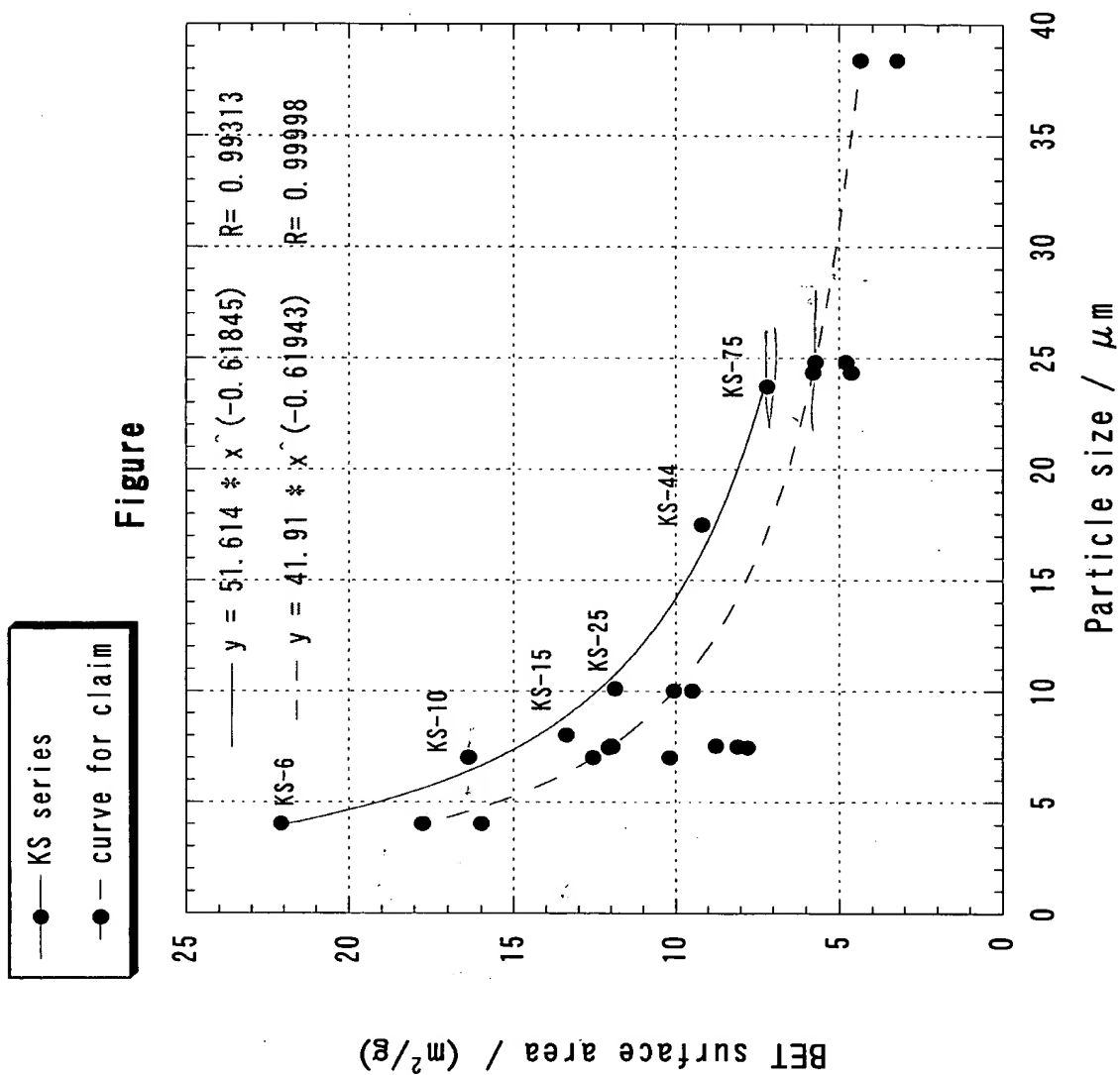
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The results are shown in the following Table 1.

Table 1

	Particle size	Specific surface area
LONZA KS 6	4.9 μm	22.0 m^2/g
LONZA KS 15	8.0 μm	13.5 m^2/g
LONZA KS 25	10.1 μm	11.9 m^2/g
LONZA KS 44	17.5 μm	9.2 m^2/g
LONZA KS 75	23.7 μm	7.2 m^2/g

The values shown in Table 1 are collectively shown in the following figure. Also, the particle sizes and specific surface areas of graphite used in Examples of the present invention are collectively shown in the following figure.





(4) Remarks

As seen from the above figure, the relationship of particle sizes and specific surface areas of LONZA KS graphite series is represented by the following formula.

$$y=51.614x^{(-0.61845)}$$

On the other hand, the relationship of particle sizes and specific surface areas in the present invention is represented by the following formula.

$$y=42x^{(-0.6)}$$

Therefore, the relationship of particle sizes and specific surface areas of LONZA KS graphite series is completely different from that of graphite used in Examples of the present invention.

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5. I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

6. Further, deponent saith not.

Date: March 9th, 2000

Hideharu Sato
Hideharu SATO



請求の範囲

1. 正極、非水電解液、セパレーター及びリチウムイオンの充放電が可能な炭素材料を使用した負極を備えたリチウムイオン二次電池において、上記の負極が次の (a) 及び (b) に規定する条件を同時に満足する黒鉛材料を一種以上含有することを特徴とするリチウムイオン二次電池。

(a) BET 法比表面積を y (m^2/g)、粒径 (μm) を x とした場合、
で表される領域内に存在する黒鉛材料。

$$y \leq 52 x^{-0.6} \quad (4 \leq x \leq 40, 0.1 \leq y \leq 25) \dots\dots (I)$$

- 10 (b) 波長 5145 \AA のアルゴンイオンレーザー光を使用したラマンスペクトル分析において、 $1570 \sim 1620 \text{ cm}^{-1}$ の範囲に存在するピークの強度を I_A 、 $1350 \sim 1370 \text{ cm}^{-1}$ の範囲に存在するピークの強度を I_B とした場合、その比である R 値 ($= I_B/I_A$) が $0.001 \sim 0.2$ の範囲である。

2. 黒鉛材料が下記の式 (II) で表される領域内に存在する請求の範囲 1 に記載のリチウムイオン二次電池。

15 $y \leq 42 x^{-0.6} \quad (4 \leq x \leq 30, 0.1 \leq y \leq 20) \dots\dots (II)$

3. 黒鉛材料が次の (c) に規定する条件を満足する請求の範囲 1 に記載のリチウムイオン二次電池。

- 20 (c) 波長 5145 \AA のアルゴンイオンレーザー光を使用したラマンスペクトル分析において、 $1570 \sim 1620 \text{ cm}^{-1}$ に存在するピークの半値幅である $\Delta\nu$ 値の大きさが $14 \sim 22$ の範囲である。

4. 請求の範囲 1～3 に記載の黒鉛材料の表面を炭素化可能な有機材料で被覆し、焼成、粉碎して調製した「非晶質炭素被覆黒鉛系炭素質物」を負極として使用することを特徴とするリチウムイオン二次電池。

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